

Orthorectified data from NOAA Coastal Services Center (data collected by Earthstar International in 2002-2003) and from U.S. Army Corps of Engineers data collected by Fugro Marine in 2000. California's State Waters limit from NOAA Office of Coast Survey Universal Transverse Mercator projection, Zone 11N.

NOT INTENDED FOR NAVIGATIONAL USE

APPROXIMATE BEACH OBSERVATION

SCALE 1:24,000
BATHYMETRIC CONTOUR INTERVAL: 10 AND 50 METERS
ONE MILE = 1.609 NAUTICAL MILES

MAP LOCATION

Potential marine benthic habitats mapped by Bryan E. Dieter, Charles A. Endris, and H. Gary Greene, 2011. Bathymetric contours by Andrew C. Ritchie, 2001.
GIS database and digital cartography by Nadine E. Golden, Charles A. Endris, and Mercedes D. Erdey.
Edited by Tanya A. Lindquist.
Manuscript approved for publication June 2, 2014.

Potential Marine Benthic Habitats, Offshore of Coal Oil Point Map Area, California

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2014

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DESCRIPTION OF MAP UNITS

UNCONSOLIDATED CONTINENTAL SHELF SEDIMENTS

- Ss(sm)_ru Soft, unconsolidated sediment (sand and mud), predominantly rippled
- Ss(sm)_ru Pockmarks or depressions, in soft, unconsolidated sediment (sand and mud)
- Ss(s)_ru Soft, unconsolidated sediment (sand), rippled
- Ss(s)_ru Terraces, or possibly delta or fan, composed of soft, unconsolidated sediment (sand), predominantly rippled
- Ssmv_u Hummocky mounds of soft, unconsolidated delta sediment
- Ss(c)_pm_u Mound of coarse-grained, soft, unconsolidated sediment (cobbles and pebbles)

MIXED SUBSTRATE ON CONTINENTAL SHELF

- Ssm_cru Hydrocarbon-seep depression, in soft, unconsolidated sediment
- Sme_cu Mixed habitat of soft, unconsolidated sediment, overlying hard, consolidated sedimentary bedrock
- Sme_cu Mixed habitat of soft, unconsolidated sediment, overlying hard carbonate substrate
- Sme_cu Mixed habitat of soft, unconsolidated sediment, overlying hard tar deposits; inferred

HARD SUBSTRATE ON CONTINENTAL SHELF

- Shm_l Hard mound made up of carbonatic rock
- Shem_l Hard, exposed tar mound
- She_crd Differentially eroded sedimentary-bedrock outcrop
- Shd_crd Deformed and differentially eroded sedimentary-bedrock outcrop
- Shbvp_l? Hard boulders or pinnacles of exposed asphalt; inferred

UNCONSOLIDATED CONTINENTAL SLOPE SEDIMENTS

- Fals_u Landslide scarp, in soft, unconsolidated sediment
- Fals(sm)_ru Soft, unconsolidated sediment (sand and mud), rippled
- Fals(sm)_ru Pockmarks or depression, in soft, unconsolidated sediment (sand and mud)

HARD SUBSTRATE ON CONTINENTAL SLOPE

- Fhd_crd Deformed and differentially eroded sedimentary-bedrock outcrop

ANTHROPOGENIC FEATURES

- Sk_a_sdu Trawl grooves and marks, in soft, unconsolidated sediment (sand and mud)
- Sam_au*(?) Oil-platform-generated shell hash mound mixed with soft, unconsolidated sediment
- Smm_a-pu Linear depression, in soft, unconsolidated sediment overlying hard anthropogenic feature (pipeline)
- Shm_a-s*(?) Oil-platform structural-foundation framework (legs and pipes) and shell mound
- Shl_a-p Hard anthropogenic feature (pipeline)

EXPLANATION OF MAP SYMBOLS

- Contact
- Area of "no data"—Areas near shoreline not mapped owing to insufficient high-resolution seafloor mapping data; areas beyond 3-nautical-mile limit of California's State Waters were not mapped as part of California Seafloor Mapping Program
- 3-nautical-mile limit of California's State Waters
- Bathymetric contour (in meters)—Derived from modified 10-m-resolution bathymetry grid. Contour intervals: 1–100 m water depth, 10 m; >100 m water depth, 50 m

DISCUSSION

This map shows "potential" marine benthic habitats in the Offshore of Coal Oil Point map area. Marine benthic habitats represent a particular type of substrate, geomorphology, seafloor process, or any other attribute that may provide a habitat for a specific species or an assemblage of organisms. Such maps are based largely on seafloor geology, and this map integrates seafloor geology (sheet 10) with information depicted on several other thematic maps of the Offshore of Coal Oil Point map area: high-resolution bathymetry (sheet 1), shaded-relief imagery (sheet 2), backscatter (sheet 3), seafloor character (sheet 5), and ground-truth information (sheet 6). This map also uses information from the uSEABED bottom-sampling compilation by Reid and others (2006). The combination of remotely observed data (for example, multibeam bathymetry and backscatter, seismic-reflection profiles) and directly observed data (for example, camera transects, sediment samples) translates to higher confidence in the ability to interpret broad areas of the seafloor.

To avoid any possible misunderstanding of the term "habitat," the term "potential habitat" (as defined by Greene and others, 2005) is used herein to describe a set of distinct seafloor conditions that in the future may qualify as an "actual habitat." Once habitat associations of a species are determined, they can be used to create maps that depict actual habitats, which then need to be confirmed by "ground-truth" surveying using in situ observations, video, and/or photographic documentation.

Marine benthic habitats are classified using the Benthic Marine Potential Habitat Classification Scheme, a mapping-anthropic code developed by Greene and others (1999, 2007). In this map series, habitat-classification codes are based on the deepwater habitat-characterization scheme developed by Greene and others (1999), which was created to not only easily distinguish marine benthic habitats but also to facilitate ease of use and queries within GIS and database programs. The code, which is summarized in chapter 6 in the accompanying pamphlet, is derived from several categories of the Benthic Marine Potential Habitat Classification Scheme (Greene and others, 1999, 2007), and it can be subdivided on the basis of the spatial scale of the data.

High-resolution, multibeam-swath data, converted to bathymetric depth grids (seafloor digital elevation models; sheet 1), are essential to development of the habitat map. Shaded-relief imagery (sheet 2) allows for visualization of seafloor terrain, providing a foundation for interpretation of submarine landforms. Areas of seafloor bedrock exposures are identified by their common sharp edges and high relative relief; these may be contiguous outcrops, isolated parts of outcrop protruding through sediment cover (pinnacles or knobs), or isolated boulders. High backscatter is further indication of "hard" bottom, consistent with interpretation as rock or coarse sediment. In many locations, areas within or around a rocky feature appear to be covered by a thin veneer of sediment, identified on the habitat map as "mixed" indication (in other words, containing both rock and sediment). Broad, generally smooth areas of the seafloor that lack sharp and angular edge characteristics are mapped as "sediment" and are further defined by various sedimentary features such as erosional scars and depressions, as well as depositional features such as dunes, mounds, or sand waves. Low backscatter, indicative of "soft" bottom, also significantly aids identification and classification of sedimentary habitats.

The Offshore of Coal Oil Point map area contains 24 potential marine benthic habitat types within two megahabitat settings: Shelf (continental shelf) and Flank (basin flank or continental slope). On the shelf, these habitat types range from predominantly soft, unconsolidated sediment (sand and mud to cobbles and pebbles) to areas of hard bedrock exposures, including flat carbonatic substrate and differentially eroded, well-bedded sedimentary-bedrock outcrops. Some sedimentary-bedrock outcrops are partly covered with soft, unconsolidated sediment to produce a hard-soft mixed habitat type. Pockmarks, tar mounds, and carbonate mounds complete the variety of habitats identified on the continental shelf in the map area. Significant anthropogenic features associated with oil production, such as platforms, pipelines, and shell mounds beneath platforms, as well as remnant mounds from past seafloor-exploitation activity, all produce artificial habitats for rockfish (*Sebastes* spp.). In the narrow band of basin-flank or continental-slope megahabitat, macro- and mesohabitats of predominantly soft, unconsolidated sediment with numerous pockmarks have been mapped. This suggests a very "loose" area where gas and fluids associated with hydrocarbon reservoirs at depth have been escaping from the seafloor.

The soft, unconsolidated sediment habitat on the Shelf megahabitat, which includes pockmarks and inferred sediment-covered tar flows (see sheet 11, this report), covers 76.13 km² of the total 109.65 km² area mapped, representing 71.3 percent of all of the potential habitat types identified. Sediment-covered bedrock on the continental shelf, which includes the mixed hard-soft habitat type, covers 5.17 km², about 4.7 percent of the potential habitats mapped. Hard bedrock exposures on the continental shelf cover 14.41 km² (13.2 percent), whereas anthropogenic features on the shelf cover almost 0.1 km², only a fraction of habitat area. On the Flank megahabitat, soft, unconsolidated sediment habitat covers 10.3 km², representing 9.4 percent of all habitats mapped in the Offshore of Coal Oil Point map area, hard bedrock exposures at the top of the slope cover 1.5 km², representing 1.4 percent of all habitat types mapped.

Fluid flow to the seafloor from petroleum reservoirs at depth resulted in the formation of hard, carbonate-cemented sediment substrate, carbonate mounds, pockmarks, and asphalt (tar) mounds. Sheet 11 of this report shows detail of seafloor hydrocarbon seepage and related asphalt and tarball accumulations. Exposed carbonate mounds and hard ground, locally covered with sediment, provide potential habitat for sessile organisms. This mix of potential marine benthic habitat types provides the varied relief, in addition to the rugosity and substrate hardness, that may contribute to the concentration of a diverse marine ecosystem within an otherwise homogeneous, soft, unconsolidated sediment habitat.

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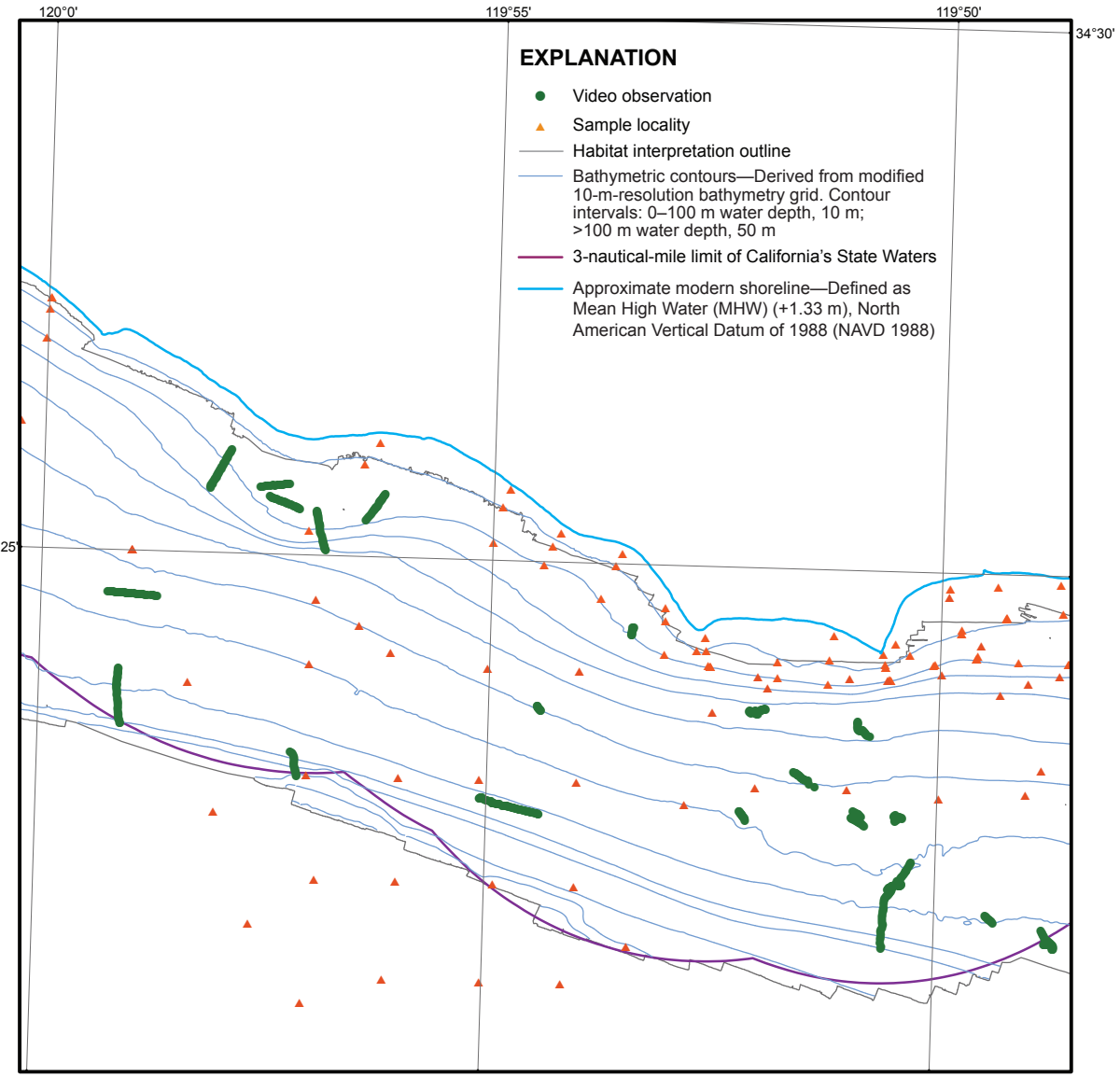
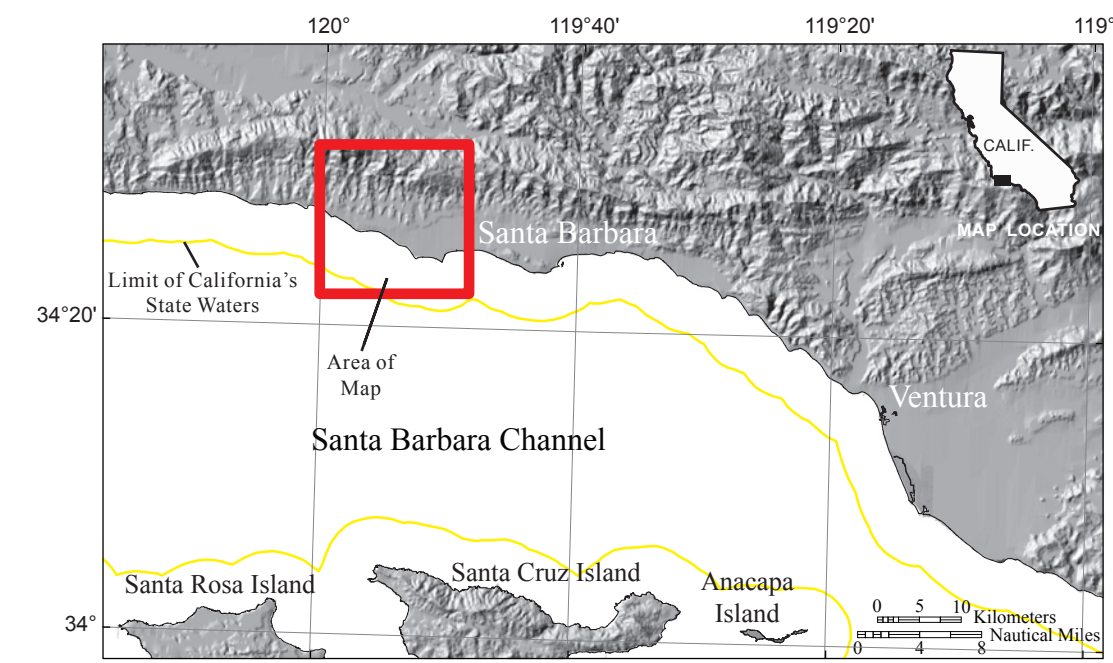


Figure 1. Map showing video-observation locations and sample localities for Offshore of Coal Oil Point map area.